

Chromosome Numbers of Japanese *Pellionia* (Urticaceae)

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Chromosome numbers of the following six Japanese species of *Pellionia* (Urticaceae) are reported: *P. brevifolia* ($2n = 39$), *P. japonica* ($2n = 52$), *P. minima* ($2n = 26, 39, 52$ and 65), *P. radicans* ($2n = 39, 52$ and 65), *P. scabra* ($2n = 26, 39, 52$ and 65) and *P. yoshiei* ($2n = 39$), all of which being first records. Each of *P. brevifolia*, *P. japonica* and *P. yoshiei* shows a single ploidy level, whereas intraspecific polyploidy is observed in *P. minima*, *P. radicans* and *P. scabra*.

Key words: Chromosome numbers, *Pellionia*, polyploids, Urticaceae.

According to Wang and Chen (1995), *Pellionia* Gaudich. of the Urticaceae consists of 70 species distributed in East and Southeast Asia. In Japan, six species, *P. brevifolia* Benth., *P. japonica* Hatus., *P. minima* Makino, *P. radicans* (Siebold & Zucc.) Wedd., *P. scabra* Benth. and *P. yoshiei* H.Hara, are recognized by Satake (1982) and Ohwi and Kitagawa (1983). According to Hatusima (1967), *P. japonica*, *P. minima*, *P. radicans* and *P. scabra* are distributed to the west of the Izu peninsula as far as the Ryukyus and *P. brevifolia* and *P. yoshiei* are limited to several areas in Kyushu. They prefer moist and shaded habitats under evergreen forests and show the following morphological features: *P. brevifolia* and *P. minima* have creeping stems with small leaves (1–3 cm long) in common but the two species are discriminated from each other by leaf features. *Pellionia brevifolia* has white spots on the surfaces of the leaves; *P. japonica*, *P. radicans*, *P. scabra* and *P. yoshiei* have large leaves (more than 4 cm long), but the four

species are distinguished by the following features: *P. scabra* is unique in having erect and lignified stems; *P. yoshiei* has white spots on the surfaces of the leaves; *P. japonica* has leaves obtuse at the tips; and *P. radicans* has leaves mucronate at the tips.

Unfortunately there are some disagreements in taxonomic treatments of these taxa among Japanese botanists. Makino (1919), Makino and Nemoto (1931), Ohwi (1978), Satake (1982), and Ohwi and Kitagawa (1983) treated *P. minima* as a distinct species, while Hatusima (1967, 1975) treated it as a variety of *P. radicans* because of the presence of plants with intermediate features. Kitamura and Murata (1961) reduced *P. minima* and *P. japonica* to synonyms of *P. brevifolia* and *P. yoshiei*, respectively, because they have no morphological differences with the exception of white spots on the leaves. More precise investigations are apparently required before establishing the final taxonomic treatment of Japanese species. Cytological analysis may be one such way to aid our understanding of the

Table 1. Chromosome numbers and number of individuals examined (in brackets) of six species of *Pellionia* in Japan

Species	Chromosome number	Locality of population samples
<i>P. brevifolia</i>	2n = 39	Kagoshima Pref.: Takakumayama, Tarumizu City (8), Hikoba, Kihoku Town (8), Takakuma valley, Kanoya City (8)
<i>P. japonica</i>	2n = 52	Wakayama Pref.: Fukui, Ryujin Village (4), Okawa, Nakahechi Town (4). Miyazaki Pref.: Koyama, Takaoka Town (2), Nitawaki, Saito City (1), Ishigawauchi, Kijyou Town (8) Kagoshima Pref.: Nitani, Chiran Town (5), Jiganji, Kagoshima City (1), Haruyama, Matsumoto Town (8)
<i>P. minima</i>	2n = 26	Wakayama Pref.: Ubuyugawa, Miyama Village (1)
	2n = 39	Wakayama Pref.: Nishikawa, Kozagawa Town (4). Miyazaki Pref.: Ishigawachi, Kijyou Town (4)
	2n = 52	Shizuoka Pref.: Nimata, Tenryu City (8). Wakayama Pref.: Nishikawa, Kozagawa Town (15), Kogomori, Hongu Town (15), Okawa, Nakahechi Town (5), Fukui, Ryujin Village (10), Ubuyugawa, Miyama Village (12), Yada, Hikigawa Town (9). Miyazaki Pref.: Ishigawachi, Kijyou Town (4), Hasekannonji, Saito City (5). Kagashima Pref.: Takaze, Mizobe Town (5), Otaki, Onejime Town (2), Haruyama, Matsumoto Town (5), Takakumayama, Tarumizu City (5), Yuwandake, Uken Village, Amamioshima (10), Sumiyougawa, Sumiyou Village, Amamioshima (10), Sendaigawa, Sumiyou Village, Amamioshima (10), Amagisan, Amagi Town, Tokunoshima (10). Okinawa Pref.: Fukujigawa, Higashi Village Okinawajima (10)
	2n = 65	Kagoshima Pref.: Takaze Mizobe Town (1), Otaki, Onejime Town (1)
<i>P. radicans</i>	2n = 39	Miyazaki Pref.: Fukuouji, Saito City (3), Hasekannonji, Saito City (2)
	2n = 52	Shizuoka Pref.: Kosugihara, Matsuzaki Town (7). Wakayama Pref.: Kokomori, Hongu Town (4), Ubuyugawa, Miyama Village (6), Koie, Ryujin Village (3), Shimobe, Kozagawa Town (5), Yada, Hikigawa Town (6). Miyazaki Pref.: Fukuouji, Saito City (3), Hasekannonji, Saito City (3), Ishigawauchi, Kijyou Town (1), Nitawaki, Saito City (3), Tagami, Saito City (2). Kagoshima Pref.: Haruyama, Matsumoto Town (4), Nakatsuno, Aira Town (3), Nishiura, Kamou Town (9), Takakumayama, Tarumizu City (2). Okinawa Pref.: Urauchigawa, Taketomi Town, Iriomotejima (6)
	2n = 65	Miyazaki Pref.: Tagami, Saito City (2)
<i>P. scabra</i>	2n = 26	Shizuoka Pref.: Tsudadamu, Inasa Town (1)
	2n = 39	Shizuoka Pref.: Oobito, Oohit Town (5). Wakayama Pref.: Nishikawa, Kozagawa Town (3), Okawa, Nakahechi Town (10), Fukui, Ryujin Village (8), Kogomori, Hongu Town (6), Oie, Ryujin Village (15). Miyazaki Pref.: Ishigawachi, Kijyou Town (5), Shiinokiiwabuchi, Kijyo Town (8), Fukuouji, Saito City (8), Koyama, Takaoka Town (7). Kagoshima Pref.: Fukagawa, Aira Town (5), Nakatsuno, Aira Town (9), Jiganji, Kagoshima City (5), Haruyama, Matsumoto Town (15), Hanase, Oonejime Town (5), Ootaki, Oonejime Town (5), Shirai, Oonejime Town (5), Choujiroutaki, Oonejime Town (10), Minamidani, OonejimeTown (5), Nitani, Chirann Town (5), Sanntaroutouge, Naze City, Amamioshima (5). Okinawa Pref.: Yonahadake, Ogimi Village (5), Urauchigawa, Taketomi Town Iriomotejima (5)

Table 1. Continued

Species	Chromosome number	Locality of population samples
	2n = 52	Shizuoka Pref.: Tsudadamu-1, Inasa Town (15), Nimata, Tenryu City (11), Oosawazato-1, Nishiizu Town (13), Kanda, Kamomura Village (13), Nitta, Heda Village (10), Tsudadamu-2, Inasa Town (17), Souzu, Tenryu City (5), Oosawazato-2, Nishiizu Town (20), Kosugihara, Matsuzaki Town (17). Kagoshima Pref.: Fukagawa, Aira Town (5), Nakatsuno, Aira Town (5), Takaze, Mizobe Town (5), Yuwandake, Uken Village, Amamioshima (5), Sumiyou gawa, Sumiyou Village, Amamioshima (5). Okinawa Pref.: Kanna, Ginoza Village (5), Nishime dake, Kunigami Village (5), Taihogawa, Ogimi Village (9), Benokidamu, Kunigami Village (10), Hijigawa, Kunigami Village (6), Yonagawa, Kunigami Village (9), Iyudake, Kunigami Village (5), Gengagawa, Nago City (8), Oura gawa, Nago City (5), Yonahadake, Ogimi Village (5), Yonahadake, Ogimi Village (7), Arakawadamu, Higashi Village (5), Hanejigawa, Nago City (5), Urauchigawa-2, Taketomi Town Iriomotejima (5), Nakamagawa, Taketomi Town, Iriomotejima (5)
	2n = 65	Miyazaki Pref.: Nitawaki, Saito City (6)
<i>P. yoshiei</i>	2n = 39	Miyazaki Pref.: Yatsushiro, Kunitomi Town, (8)Hasekannnonji, Saito City (8)

taxonomic relationships between Japanese species of *Pellionia*. Chromosome numbers of some species of *Pellionia* have been reported in exotic species; 2n = 24 for *P. repentes* by Morawets and Samuel (1989), 2n = 26 for *P. daveauana* by Krause (1930, 1931), 2n = 26 for *P. pulchra* by Krause

(1931) and Lecoq (1963), 2n = 26 for *P. repens* by Subramanian and Thilagavathy (1988), 2n = 52 for *P. argentia* by Lecoq (1963), and 2n = 52 for *P. begonifolia* by Krause (1931) and Lecoq (1963). No Japanese species, however, have been examined cytologically. In the present paper,

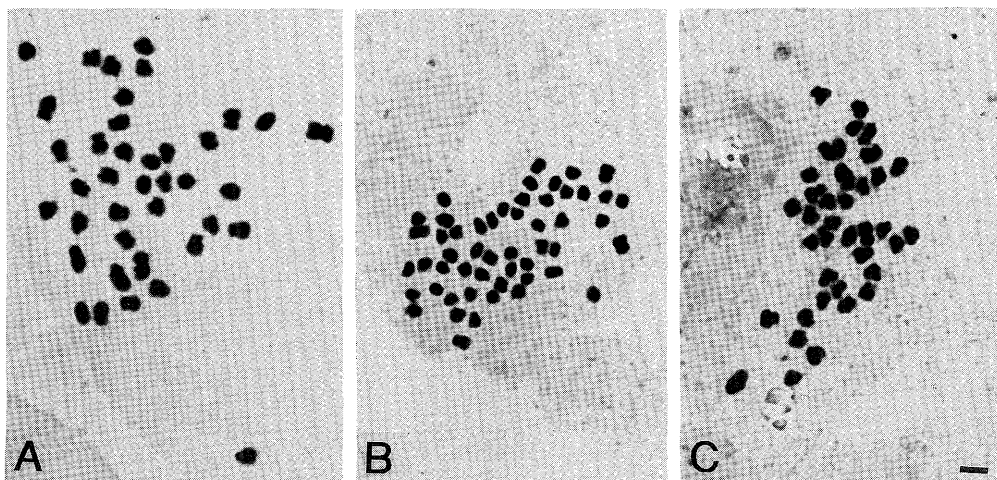


Fig. 1. Somatic metaphase chromosomes of three species in Japanese *Pellionia*. A: *P. brevifolia* (2n = 39). B: *P. japonica* (2n = 52). C: *P. yoshiei* (2n = 39). Bar indicates 1 μm.

therefore, chromosome numbers of all Japanese taxa of *Pellionia* are reported.

Materials and Methods

The 729 plants used in the present study were collected from natural populations at 40 localities (Table 1) and were cultivated in the Botanic Gardens of Toyama. Since vegetative reproduction by creeping stems occurs to a considerable extent in *Pellionia*, collection was done at intervals of appropriate distances (about 3–5 m) when more than two collections were made in one population. The assignment of samples to taxa follows

Satake (1982) and Ohwi and Kitagawa (1983).

Somatic chromosomes were observed in meristematic cells of root tips. Fresh root tips, 5 mm long, were pretreated in 0.002 M 8-hydroxyquinoline solution for 8 hr at 20 °C and fixed in a 3 : 1 mixture of 99.5 % ethanol and glacial acetic acid for 20 hr. The fixed root tips were then macerated in 1N HCl at 60 °C for 10 seconds, and the meristematic region of root tips were stained with 1 % aceto-orcein. Preparation for observation was done by squashing methods. The voucher specimens are deposited in the her-

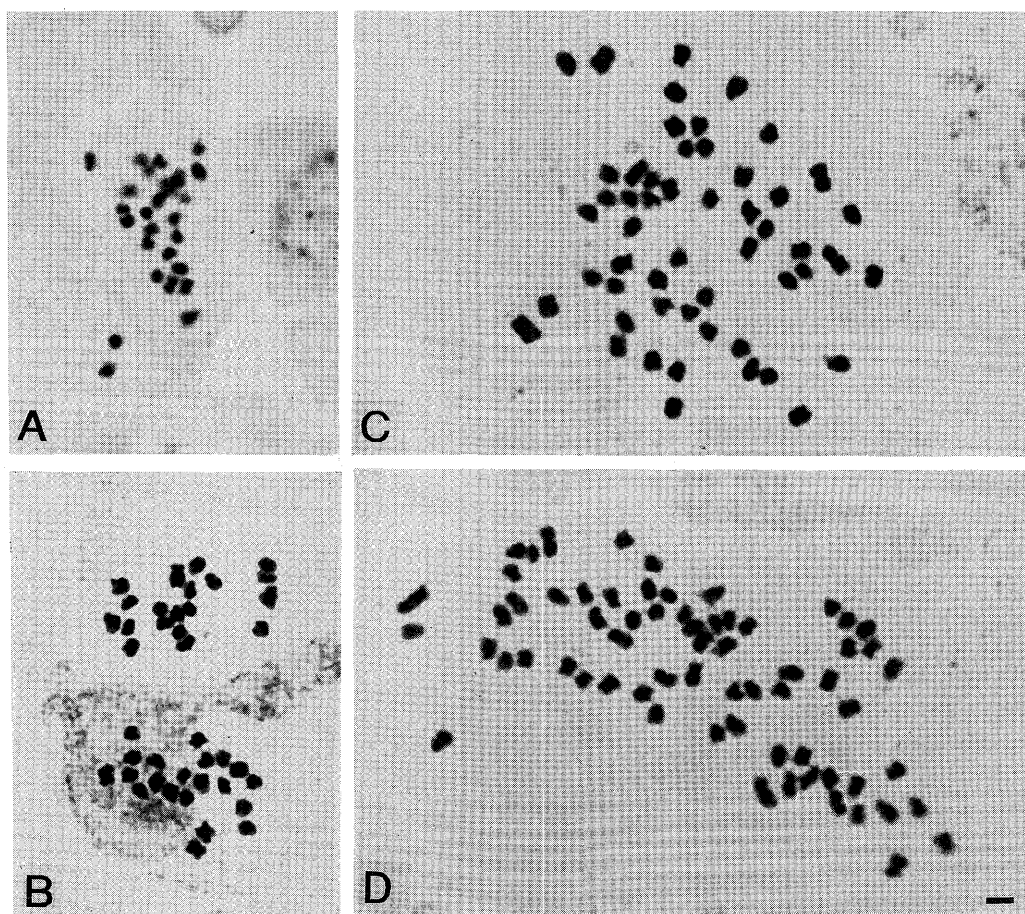


Fig. 2. Somatic metaphase chromosomes of *Pellionia minima*. A: $2n = 26$. B: $2n = 39$. C: $2n = 52$. D: $2n = 65$. Bar indicates 1 μm .

barium of the Botanic Gardens of Toyama (TYM).

Results and Discussion

Chromosome numbers observed in the

present study are shown in Table 1. They are $2n = 39$ in *P. brevifolia* (Fig. 1A) and *P. yoshiei* (Fig. 1C); $2n = 52$ in *P. japonica* (Fig. 1B); $2n = 26, 39, 52$ and 65 in *P. minima* (Fig. 2); $2n = 39, 52$ and 65 in *P.*

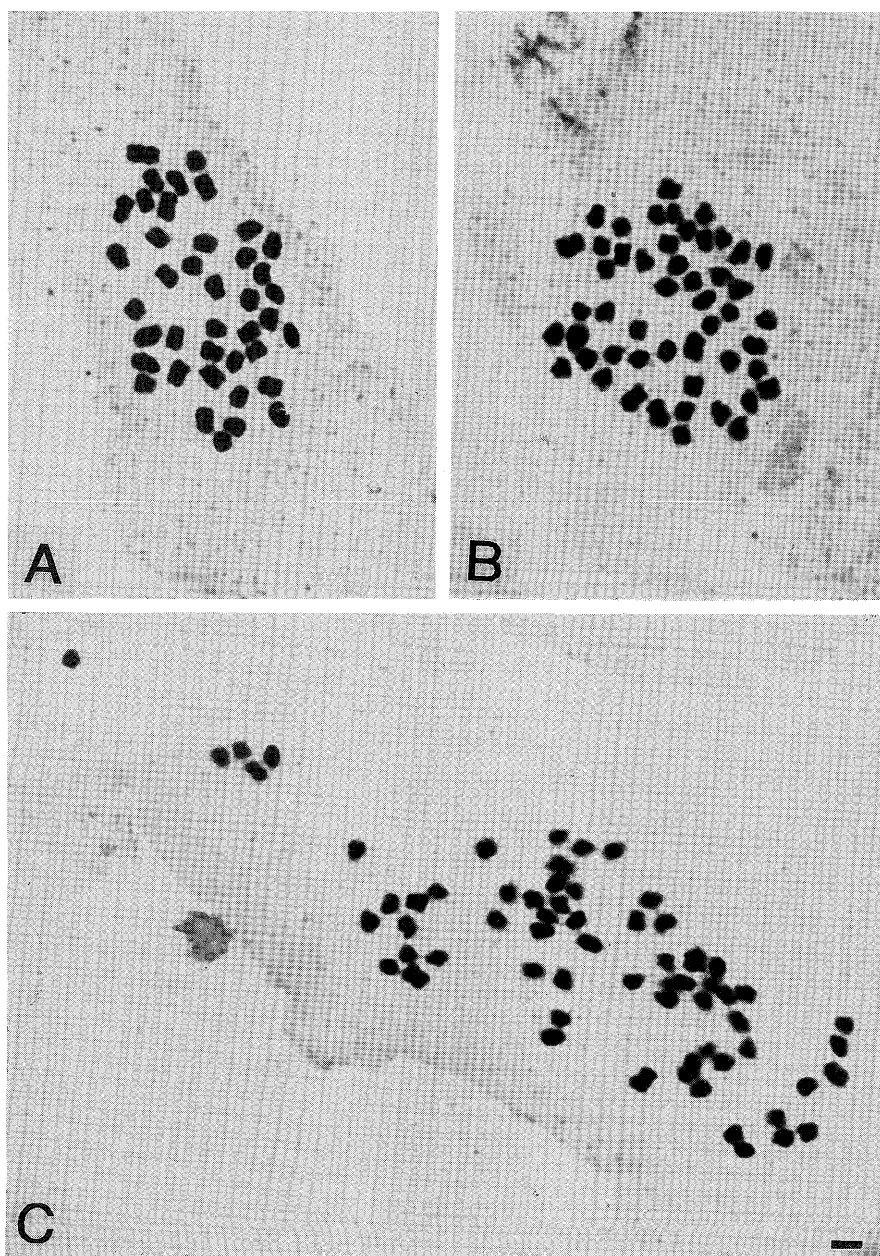


Fig. 3. Somatic metaphase chromosomes of *Pellionia radicans*. A: $2n = 39$. B: $2n = 52$. C: $2n = 65$. Bar indicates $1 \mu\text{m}$.

radicans (Fig. 3); $2n = 26, 39, 52$ and 65 in *P. scabra* (Fig. 4). These chromosome numbers were determined for the first time. The chromosomes of the six species of *Pellionia* are relatively small being $0.2\text{--}1.0\text{ }\mu\text{m}$ long and vary slightly in length among the chromosome complement. The centromeric positions of the chromosomes are obscure. Therefore, a karyotypic analysis by idiogram is not effective in the genus *Pellionia*.

The basic chromosome numbers of $x = 12, 13$ and 14 are reported in the Urticaceae (Melchior 1964, Raven 1975). As the chromosome numbers of species in *Pellionia* were $2n = 24, 26$ and 52 from previous reports, the basic chromosome number of the genus *Pellionia* is estimated to be $x = 12$ and 13 . Thus, Japanese plants with $2n = 26, 39, 52$ and 65 are considered to be diploid,

triploid, tetraploid and pentaploid based on $x = 13$, respectively. Consequently, *Pellionia brevifolia* ($2n = 39$) and *P. yoshiei* ($2n = 39$) are regarded as triploid, *P. japonica* ($2n = 52$) as tetraploid, *P. minima* and *P. scabra* as consisting of di-, tri-, tetra- and pentaploids and *P. radicans* as consisting of tri-, tetra- and pentaploids.

Chromosome numbers have frequently proved useful in taxonomy, i.e., they reinforce classifications based on morphological or other characters among taxa with their same or different numbers (Stace 1989, Stuessy 1990). In the present study, although chromosome numbers are not useful for species delimitation as various ploidies were found in *P. minima*, *P. radicans* and *P. scabra*, chromosomal information suggests that *P. brevifolia* and *P. yoshiei* are triploid

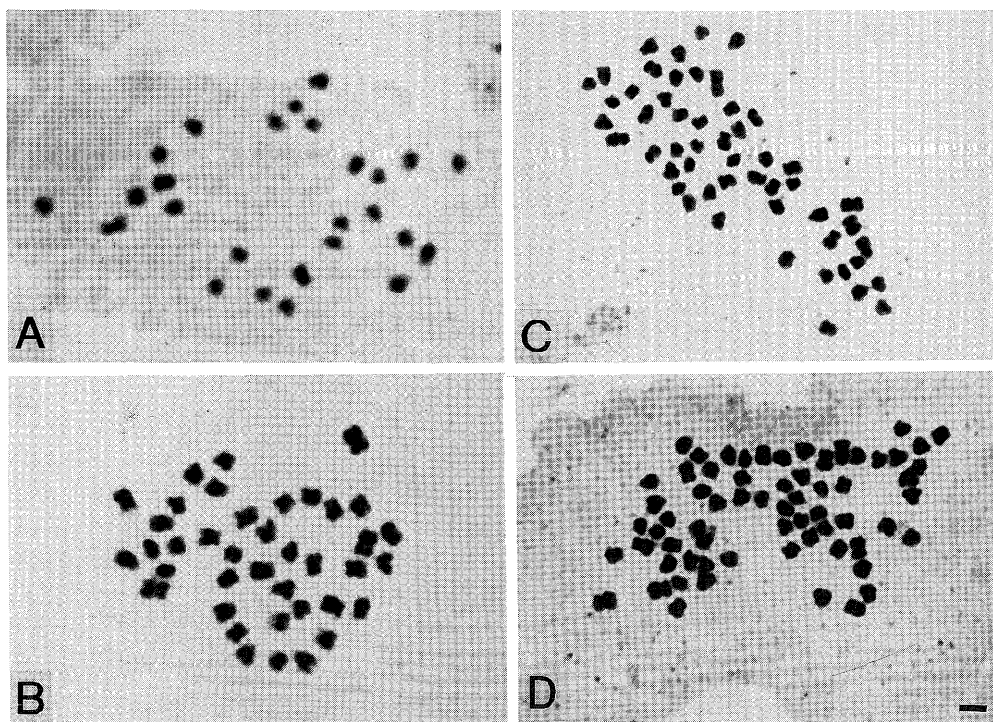


Fig. 4. Somatic metaphase chromosomes of *Pellionia scabra*. A: $2n = 26$. B: $2n = 39$. C: $2n = 52$. D: $2n = 65$. Bar indicates $1\text{ }\mu\text{m}$.

and thus reproductions of both species can be interpreted in terms of apogamy.

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兼本 正^a, 鳴橋直弘^b: 日本産サンショウソウ属の染色体数

日本産イラクサ科サンショウソウ属 *Pellionia* のオオサンショウソウ *P. radicans*, サンショウソウ *P. minima*, キミズ *P. scabra*, キミズモドキ *P. japonica*, ナガバサンショウソウ *P. yoshiei*, アラゲサンショウソウ *P. brevifolia* の染色体数を初めて報告した。キミズモドキからは $2n=52$, ナガバサンショウソウとアラゲサンショウソウからは $2n=39$, サンショウソウとキミズからは $2n=26, 39, 52, 65$, オオサンショウソウからは $2n=39, 52, 65$ が算定された。

Melchior (1964) および Raven (1975) はイラクサ科の基本数として $x=12, 13$ および 14 を報告している。これまで報告されているサンショウソウ属

の染色体数は $2n=24, 2n=26$ と 52 であることから、サンショウソウ属の基本数は $x=12, 13$ が考えられる。今回観察された日本産のサンショウソウ属 6 種からは $2n=26, 39, 52, 65$ が算定されていることから日本産サンショウソウ属は $x=13$ を基本数としており、ナガバサンショウソウとアラゲサンショウソウは三倍体、キミズモドキは四倍体であり、キミズ、サンショウソウとオオサンショウソウには種内倍数性が認められ、それぞれキミズとサンショウソウには二倍体、三倍体、四倍体、五倍体、オオサンショウソウには三倍体、四倍体、五倍体が存在している。 (*富山県中央植物園, ^b富山大学理学部生物学科)